Alder Hey Children's NHS
NHS Foundation Trust

Operational Policy and Guidance On The Use Of Cytotoxic Drugs

For The Treatment Of Malignant Disease

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INTRODUCTION

The purpose of this document is to set out policy and guidance for the Safe Prescribing, Handling and Administration of Cytotoxic Chemotherapy for patients with malignant disease treated as an in-patient, day case or out-patient at the Alder Hey Children's NHS Foundation Trust. It forms part of the Trust Medicines Management Code.

This policy is intended to safeguard patients and staff, by defining best practice for all disciplines involved in cytotoxic chemotherapy.

The handling and administration of cytotoxic drugs is potentially hazardous to both the health care professionals involved in their preparation and administration, and to the patients receiving them. While the risks to patients are, in the main, well documented and can be balanced against the clinical benefits, the risks to health care staff are largely theoretical. It is therefore prudent with the present state of knowledge to take every reasonable precaution to protect staff from unnecessary exposure. This policy aims to minimise these risks by promoting the safe handling of cytotoxic drugs.

To minimise exposure to these hazardous substances and maintain patient safety staff must adhere to this policy at all times.

Staff must ensure that they have received training appropriate to their level of involvement.

This policy will be made available on the Trust intranet.

1.1 Scope

This document applies to cytotoxic drugs used for the treatment of malignant disease. It does not deal with chemotherapy specifically for immunosuppressive purposes, or for the treatment of non malignant diseases.

For the purposes of this document, the term **cytotoxic drug** is used to refer to all drugs with direct anti-tumour activity including conventional anticancer drugs, monoclonal antibodies, and partially targeted treatments (such as Imatinib).

The term **chemotherapy** refers to the use of those cytotoxics agents

commonly understood and accepted as being covered by this term. Chemotherapy is referred to as being given over a complete period of treatment known as a **course**, which consists of giving drugs over a repeated pattern known as a **cycle**

For entirely oral chemotherapy a cycle may be defined by the length of time between mandatory reviews. The maximum intended number of cycles and therefore length of the course may be pre determined or fixed, or dependent on various factors and therefore indeterminate or variable from the outset. The separate occasions when drugs are given within a cycle are termed administrations.

Intrathecal therapy
This document does not cover in detail the practice of intrathecal chemotherapy. The Trust Medicines Management Code, Policy on the Management of Intrathecal Cytotoxic Drugs and national guidance must be adhered to.

Oral chemotherapy
Guidance is provided in this document in relation to oral chemotherapy. In addition the Trust Medicines Management Code on Safe use of oral anticancer medicines must be followed.

2. HEALTH AND SAFETY

Cytotoxic drugs interfere with cell division, but as this action is not specific to tumour cells, normal cells may also be damaged. As a result, they can produce significant side effects in treated patients, or others exposed. This, together with the increasing complexity of chemotherapy, has raised concerns about the risks to health care workers involved in the preparation and administration of chemotherapy and/or the caring of patients undergoing treatment.
For healthcare personnel the potential of exposure exists during tasks such as drug reconstitution and preparation, administration and disposal of waste equipment or patient waste. Hence, all staff involved in the delivery of services to cancer patients must be aware of all health and safety procedures.
The more common routes of exposure are contact with skin or mucous membranes (e.g. spillage and splashing), inhalation (over-pressurising vials), and ingestion (e.g. through eating, drinking or smoking in contaminated areas or from poor hygiene). Less likely routes of exposure include needle-stick injuries, which can occur during the preparation or administration of these drugs.
Some cytotoxic drugs can cause acute or short-term health effects including irritation to the skin, eyes and mucous membranes. Information on chronic, or long-term, health effects of cytotoxic drugs mainly comes from data in animals and from patients given therapeutic doses.

It is not certain how relevant this is to workers and any occupational exposures are likely to be at much lower levels. The adoption of safe handling techniques reduces the potential for exposure to cytotoxic drugs significantly.

2.1 Staff monitoring and health surveillance

Due to their hazardous nature, cytotoxic drugs are covered by the COSHH regulations 2002

All relevant new employees should receive an orientation to the Cytotoxic Policy as soon as possible after commencement of employment. The primary focus of safety during the preparation and administration of cytotoxic drugs must be on control of the working environment, minimising exposure and safe practice.

All accidental exposure to cytotoxic agents (e.g. spillages, needle stick injuries, skin or eye contamination) must be reported on an 'incident form'. Occupational Health must be informed. For emergency treatment staff should go directly to the Occupational Health department between 9am and 5pm, Monday to Friday, and to the Accident and Emergency Department at all other times.

2.2 Pregnancy and Breast feeding

As the pre-conception period is not included in any health and safety advice, managers must ensure that a risk assessment is carried out in all areas where cytotoxic drugs are handled. This risk assessment should assume that there might be a new or expectant mother working in the environment in the following twelve months.

Precautions must be in place at all times to minimise exposure; this policy aims to reduce the risk of exposure to these drugs as far as possible. However, as there is no known limit where exposure is thought to be safe, employees must be fully informed of the potential reproductive hazards.

Employees should notify their managers as soon as possible if they are pregnant, trying to conceive or are breastfeeding.

This is particularly important as the greatest risk is during the first three months of pregnancy, when rapid cell division and differentiation occurs. At the point where an employee discloses pregnancy, a risk assessment specific to the individual should be carried out and any appropriate action taken.

Staff must not administer cytotoxics during throughout pregnancy and must never reconstitute cytotoxics whilst pregnant. Pregnant staff should also be aware of the risks of handling body fluids from patients receiving cytotoxic drugs. Staff have the right to be moved away from chemotherapy areas whilst pregnant.

If appropriate, the line manager and Human Resources Department, together with the member of staff, will agree any new temporary arrangements. The Human Resources Department will be consulted if no suitable alternative employment is found. New, expectant and breastfeeding mothers should be specifically advised against any direct involvement in the management of a cytotoxic drug spillage.

2.3 Protective clothing

(NB These guidelines should be followed when handling any drug that is cytotoxic or needs to handled as such)

Protective clothing to be worn by hospital staff (excluding pharmacy staff, refer to pharmacy procedures)

(i) ***Gloves***

Non sterile disposable gloves of appropriate quality (e.g. powder free nitrile gloves, long cuff and tested for permeability to cytotoxic drugs) must be worn at all times when handling cytotoxic drugs, body fluids and administration equipment potentially containing cytotoxic drugs. These can be ordered from stores identified as cytotoxic sterile or non sterile nitrile gloves as appropriate.

Gloves should be changed immediately if torn punctured or contaminated.

(ii) ***Additional protective clothing***

A disposable apron must be worn at all times when dealing with body fluids as per Infection Control Policy 1.

If preferred, additional protective clothing may be worn when handling cytotoxic drugs or associated waste: disposable apron, disposable cytoprotective armlets and goggles (BS 2092C).
Apron and additional protective clothing should be changed immediately if torn, punctured or contaminated.

Protective clothing to be worn by Parents/carers

Gloves

Disposable gloves of appropriate quality (e.g. powder free, nitrile gloves, long cuff and tested for permeability to cytotoxic drugs) must be worn at all times when handling cytotoxic drugs for parenteral administration

Non sterile disposable gloves of appropriate quality (e.g. powder

free, nitrile gloves, long cuff and tested for permeability to cytotoxic drugs) must be worn when handling body fluids potentially contaminated with cytotoxic drugs. Parents/carers should avoid touching cytotoxic tablets, capsules or suspensions. Disposable gloves should be worn if there is a risk of contact.

Gloves *should be changed immediately if torn, punctured or contaminated.*

3 PLANNING PARENTERAL CHEMOTHERAPY ADMISSIONS

3.1 Chemotherapy admission limits

There should be no more than **four complex or five simple** oncology/ haematology cytotoxic drug therapy admissions per day (including day cases).

Simple Chemotherapy is classed as: Up to two different boluses and one infusion.

Complex chemotherapy is classed as: More than simple

Patients requiring bolus dose cytotoxic drug therapy only (e.g. in clinic or theatre) are not included in these limits.

3.2 Start Time of Chemotherapy Cycle

Parenteral cytotoxic drug therapy cycles should not routinely commence at weekends, bank holidays or at night, with the exception of stem cell mobilisation. Where emergency treatment is required at a weekend, bank holiday or at night approval must be given by the patient's consultant, and the oncology pharmacist (contact the Principal Oncology Pharmacist/Pharmacy Service Manager if required). Deadlines for prescribing parenteral cytotoxic drug therapy should still be adhered to. Refer to Out of Hours Chemotherapy section for further information.

3.3 Responsibility for planning chemotherapy admissions

In order to avoid unnecessary delays in treatment it is the responsibility of the Advanced Nurse Practitioner to ensure that cytotoxic drug therapy admissions are arranged in advance. Ideally this should be done at discharge following a previous chemotherapy admission. In addition consideration must be given to any investigations/monitoring that may be required prior to the next course of cytotoxic drug therapy. Planned admissions must be written in the Chemotherapy planning diary.

The oncology pharmacist will review the chemotherapy planning diary at least weekly.

3.4 Action to take if limits exceeded

Where chemotherapy admissions are likely to exceed the recommended limits this should be discussed by the Advanced Nurse Practitioner, Oncology Pharmacist and Consultant. Treatment may be delayed. In exceptional circumstances the limits can be exceeded.

3.5 Location of Chemotherapy Delivery

All chemotherapy is delivered within the Oncology Unit alone. If deemed necessary by the paediatric oncology team the patient may need to be admitted to Paediatric Intensive Care Unit (PICU) or (HDU) but all chemotherapy delivered in these areas is instigated by Oncology Unit staff.

All patients requiring outpatient care are seen on Oncology Daycare which is open Monday-Friday 0900-1700hrs

4. OUT OF HOURS CHEMOTHERAPY

Refer to Planning Parenteral Cytotoxic Drug Therapy Admissions for further information

4.1 Aim to balance risk of not getting treatment Vs medication error.

It is not feasible to train pharmacists working weekends or oncall to be fully competent in checking a new chemotherapy prescription and preparing cytotoxics.

Three stages to training:-

Checking prescription/work sheets	Only pharmacist trained in oncology
Making product	Only cytotoxic trained technicians
Final Check Releasing product	All weekend CIVAS pharmacists are trained to do this

4.2 Planned treatment

Planned treatment can be started at a weekend/bank holiday provided the prescription is checked by an oncology trained pharmacist, worksheets are prepared and checked, clinical tests are available or available on day treatment due. Such cases should be discussed with the oncology pharmacist and nursing staff.

Continuation treatment will be made at a weekend/bank holiday.

4.2.1 Planned Treatment that has been prescribed and made but administration not started

Chemotherapy not available for administration (leak, burst bag, precipitation, not made, expired)

<u>Weekend service 9-3pm</u>
Preparation will be remade

<u>Oncall</u>
Pharmacist will check to see if anymore has already been made - if not available consultant will defer treatment.

4.2.2 Planned Treatment already started/part way through

Chemotherapy not available for administration (leak, burst bag,

precipitation, not made, expired)

Weekend service 9-3pm

Preparation will be remade. Pharmacist will discuss with consultant/Oncology Specialist registrar dose required taking into account any part dose that may have already been administered.

Oncall

Pharmacist will check to see if anymore has been made.
If another dose is available treatment may be restarted but pharmacist will discuss with consultant whether full contents of container should be given - part of previous dose may have already been administered. Consideration should be given to the risk of administering the full dose in error if the patient has already received part of the previous dose.
If another dose is not available consultant will defer treatment. Pharmacist will discuss with consultant action to take if any other chemotherapy available.

4.2.3 Planned treatment supportive hydration burst

Weekend service 9-3pm

Preparation will be remade

Oncall

Mesna hydration or sodium bicarbonate

Pharmacist will check to see if anymore available. If not product will have to be made on ward by nursing staff. Pharmacist will assist ward in calculations and provide mesna ampoules or sodium bicarbonate.

Hydration to accompany Cisplatin. The following hydration may be required:-
Mannitol 6g/500ml
Dextrose 2.5%/Saline 0.45%
Potassium Chloride 10mmol/500ml

Hydration should continue. Pharmacist will check to see if anymore available. If not it is acceptable to give Dextrose 5%/Saline 0.45%, Potassium Chloride 10mmol/500ml. Mannitol 10% (10g/100ml) can be Y sited.

4.2.4 Intrathecals

Weekend service 9-3pm

Intrathecals requested at a weekend should be checked by an oncology pharmacist. In these cases the weekend pharmacist should contact an oncology intrathecal-trained pharmacist if not available contact the Head of Pharmacy.

Intrathecals must not be made oncall - defer treatment

4.3 Emergency treatment

Where possible notice of potential emergency treatment will be given by consultant. Treatment will be prescribed and made in advance where possible.

In the majority of cases treatment can wait until after the weekend/bank holiday or until a trained oncology pharmacist is available. Alternative therapy may be started e.g. steroids.

There are situations which may arise where emergency treatment for a new patient is required at a weekend/bank holiday (not oncall). The consultants have agreed that in the event of getting such a patient the treatment required can be standardised as detailed below:

1) Neuroblastoma with cord compression (Could get 1 case every 10 years)

Patients will receive:

Vincristine 1.5mg/m^2 (maximum 2mg) as an IV bolus over 3-5 minutes PLUS
Cyclophosphamide 1g/m^2 IV infusion over 30 minutes.
Hydration with Dextrose 5%, Sodium Chloride 0.45%, potassium chloride 10mmol/500ml must be given also with Cyclophosphamide at a rate of 125ml/m^2/hour starting at least 30 minutes before the Cyclophosphamide, continuing throughout Cyclophosphamide infusion and for at least 3 ½ hours after – i.e. 4 ½ hours in total.

Caution for children < 10kg body weight: Age related dose reductions may be required at consultants discretion, as follows : < 6months = 50% of the calculated dose by body surface area; 6months to 12 months of age= 75% calculated dose by body surface area ; > 12 months of age= full dose

2) High Count AML
Cytarabine (cytosine) 100mg/m^2 12 hourly by IV bolus days 1 to 10 inclusive (20 doses in total)
The usual starting of dose of cytarabine 100mg/m^2 may be reduced to 25mg/m^2 or 50mg/m^2 at the consultant's discretion until the count is reduced sufficiently to allow an increase in dose.

Additional therapy of etoposide and daunorubicin may be required but this will be started after the weekend.

3) APL
ATRA (**all-trans retinoic acid)** 25 mg/m^2/day orally in two divided doses for 30 days inclusive
Patients who present with a WBC ≥10x10^9/L should receive Dexamethasone 5 mg/m^2/dose (max single dose 10mg) 12-hourly iv. for the first 5 days of chemotherapy as prophylaxis against retinoic acid syndrome).

In cases of hyperleukocytosis the consultant may request cytarabine as described for High risk AML, number of days may vary.

4) High count ALL
Steroids may be started at a weekend. If the patient requires chemotherapy at a weekend this must be planned in advance.

In exceptional circumstances a consultant may request other cytotoxic chemotherapy in an emergency. This MUST be a consultant request and all other possibilities must have been considered. Contact a principal pharmacist for approval.

The weekend pharmacist will contact an oncology trained pharmacist to assist. Prescriptions must be prescribed by the consultant. The consultant may be asked by the pharmacist to check work sheets and labels. Parenteral chemotherapy cycle should be prescribed on Chemocare if available.

4.4 Emergency treatment on-call

In exceptional circumstances a consultant may request cytotoxic chemotherapy on-call. This MUST be a consultant request and all other possibilities must have been considered. Contact a principal pharmacist for approval.
On-call pharmacists are not trained in cytotoxic chemotherapy therefore they MUST contact an oncology pharmacist to come in and assist.
Pharmacists are not trained to prepare cytotoxic chemotherapy – therefore

there is a list of cytotoxic-trained technicians who have agreed to be contacted if any cytotoxic products need making.
In the first instance contact the Senior Cytotoxic Technician.
NB. There is no formal rota for oncall cytotoxic preparation. In the event that there is no trained staff available treatment will be delayed until the following day.

Intrathecals must not be made oncall - defer treatment

5.1 PRESCRIBING CHEMOTHERAPY FOR MALIGNANT CONDITIONS AT THE PRINCIPAL TREATMENT CENTRE

This policy should be used in conjunction with section 5 of the Medicines Management code, the Medicines Management Key Points for Safety booklet and the ChemoCare User Manual.

The term chemotherapy refers to the use of those cytotoxics agents commonly understood and accepted as being covered by this term. Chemotherapy is referred to as being given over a complete period of treatment known as a course, which consists of giving drugs over a repeated pattern known as a cycle

For entirely oral chemotherapy a cycle may be defined by the length of time between mandatory reviews. The maximum intended number of cycles and therefore length of the course may be pre determined or fixed, or dependant on various factors and therefore indeterminate or variable from the outset.

5.1 Decision to treat and treatment plan

The decision to treat a patient with chemotherapy should be made by a Cancer specialist (Consultant), and the patient should be discussed at an appropriate Multidisciplinary Team Meeting (MDT).

All patients should have a treatment plan for each complete course of chemotherapy they undergo. This treatment plan must be recorded in the patient's case notes, authorised and signed by a consultant oncologist or haematologist. The consultant must complete, sign and date the Chemotherapy treatment plan checklist and file in the case notes. In addition to this an initial patient summary is produced giving detailed information regarding all aspects of presentation, diagnosis, communication with family and treatment plan. This is sent to all health care professionals expected to have input into patient care.

Records to support the treatment plan can be referred to
The treatment plan should include the following information:

- GP notified of cancer diagnosis within 24 hours of diagnosis (fax).
- Diagnosis and staging (*Case notes and MDT record*)
- Medical assessment including relevant investigations, performance status and co-morbidities *(Case notes)*
- Review patient for trial eligibility and discuss with patient
- Treatment Intent *(Case notes)*
- Drug Regimen, doses and route of administration (including cytotoxic chemotherapy drugs and elective supportive drugs other than

anitemetics), planned numbers of cycles and frequency *(Refer to protocol in case notes, flow chart, chemotherapy prescriptions, Chemocare, or write in case notes)*
- Dose modifications *(Protocol or document in case notes)*
- Tests required prior to starting the whole course *(Protocol, Work up sheets, Chemocare prescriptions or document in case notes)*
- Tests required during the course with intended frequency *(Protocol, Chemocare prescriptions or document in case notes)*
- Any deviation from protocol and why *(document in case notes)*
- *Obtain consent (see section 5.2)*

NB Planned attendances will be managed by Advanced Nurse Practitioners staffing day care and in patients.
Parenteral cytarabine only and oral chemotherapy may be given at a POSCU or in the community (as detailed in the Constitution Children and Young people's Cancer Clinical Network Group). All other chemotherapy will be given at the PTC.

5.2 Consent

A consent form must be signed prior to starting a complete course of chemotherapy.

For patients on a clinical trial a trial specific consent form must be used. For non trial treatments the Alder Hey Children's NHS Foundation Trust Clinical Consent Form must be used and include the following:
- Regimen details
- Treatment intent (curative, palliative etc.)
- Details of the toxicities discussed
- Confirmation of delivery of standardised written information.
- Specified Key Worker *(Recorded in family held record)*

A copy of the consent form should be given to the patient as well as one being filed in the patient's case record.

Standardised written information is given to patients which is relevant to a particular chemotherapy regimen.

5.3 Pre-prescribing and Deadline for Prescribing Parenteral Chemotherapy

Pre-prescribing (prescribing in advance) is required for the majority of elective chemotherapy treatments.

Where possible treatment should be prescribed one week in advance. Transplant prescriptions are required two weeks in advance. It is the responsibility of the Consultants and Specialist Registrars to co-ordinate the prescribing of cytotoxic drug therapy for patients within their particular specialty. The oncology pharmacist will assist with this planning.

In order to avoid unnecessary delays in treatment and to ensure a day case service can be provided the following prescribing deadlines must be adhered to:-

- Parenteral chemotherapy for newly diagnosed/relapsed patients (only) must be prescribed by 1 p.m. on the day treatment is due.

- All other parenteral chemotherapy (excluding intrathecals) must be prescribed 3 days prior to treatment (Monday to Friday). This will mean treatment due on a Thursday needs to be prescribed on the previous Monday. Note treatment due on a Monday needs to be prescribed on the previous Wednesday.

- Intrathecal therapy should be prescribed by 12 noon, 2 days prior to treatment. This can be extended to 3pm in exceptional circumstances.

Where a prescription is written or clinical check list completed after the above deadline treatment may be delayed. The oncology pharmacist, senior nurse and advanced nurse practitioner must be consulted to arrange preparation and administration of chemotherapy. If a delay in therapy is envisaged the patient's consultant must be informed and the time of patient admission rearranged.

5.4 Authority to Prescribe Chemotherapy

5.4.1 First Cycle prescribing

The prescriber of the first cycle of chemotherapy must have undertaken specific training, demonstrated competency and be on the list of authorised prescribers for first cycle of chemotherapy

Provided a treatment plan/checklist (section 5.1) is in place (with essential information documented), authorised and signed by the consultant responsible for patient care, the following health care professionals can be authorised to prescribe a first cycle of chemotherapy.

- Consultants
- Specialist Registrars ST4 and above,
- Specialist NCCG in paediatric oncology
- Research/ Clinical Fellows at ST4 and above

5.4.2 Prescribing subsequent cycles

The following heath care professional can be authorised to prescribe subsequent cycles of chemotherapy provided they have undertaken specific training, demonstrated competency and are on list of authorised prescribers:

- Consultants
- Specialist Registrars ST4 and above,
- NCCG
- Research/Clinical Fellows at ST4 and above
- Other health care professionals: ANP or pharmacists may be trained and authorised to prescribe chemotherapy as independent or supplementary prescribers (see 5.18, 5.19; section 27 of the Medicines Management Code and Trust policy C34).

All other junior doctors must not prescribe or transcribe parenteral or oral cytotoxic chemotherapy. Prescribing by a non-specialist or by a junior doctor will be considered a clinical incident and reported using the Trust's incident reporting procedures.

5.4.3 Register of authorised prescribers of chemotherapy

A register must be kept of all authorised chemotherapy prescribers. The register is maintained by the oncology pharmacist, authorised by the Head of Service for Chemotherapy and stored on the oncology and pharmacy k drive. The register will be reassessed annually by the Head of Service for Chemotherapy at the PTC Chemotherapy Group. The register makes clear who can prescribe a first cycle of chemotherapy, subsequent cycles, prescribe for clinical trials, and restrictions to prescribing if any.

5.4.4 Authorised prescribers of chemotherapy clinical trials

Only authorised chemotherapy prescribers can prescribe investigational medicinal products (IMPs) in a clinical trial. In addition to the training detailed above the prescriber must be trained in GCP and have a certificate confirming this.
For each individual trial the prescriber must complete the delegation log in the site master file in the clinical trials research office.

5.4.5 Intrathecal therapy prescribing

Only Consultants, NCCG, or Specialist Registrars, specially trained, certificated and registered at Alder Hey to prescribe intrathecal therapy, can under take this task. Refer to the Medicines management code, Policy on the Management of Intrathecal Cytotoxic Drugs

5.5 Oncology and haematology treatment regimens

Treatment should be prescribed in accordance with the PTC and MCCN network agreed regimens and protocols list. This list is available on the oncology K drive and MCCN website

5.5.1 Process for addition of regimens to PTC and MCCN network agreed regimens and protocols list.

Clinical trials
Clinical trials must be submitted and approved by Local Clinical Governance, to include all regulatory, ethical requirements and local Research and Development approval. Approval will include both clinical, pharmacy and financial approval.

Chemotherapy Guidelines
Guidelines from a recognised national or international peer reviewed group (e.g CCLG) or standard arm therapy from a closed trial (to be used as standard of care) must be reviewed by a consultant and oncology pharmacist.
If there are significant funding or resource implications, approval from CBU (clinical business unit) leads must be obtained.
The guideline must subsequently be approved for use by the Chemotherapy Group. The chair of the Chemotherapy Group will inform the chair of the Drugs and Therapeutics Committee (DTC) in writing, by email and copy to the secretary of DTC.

If the guideline includes a drug that has not been previously approved for that indication a CDEG application must be completed. If it includes a new drug, a new drug request form is also required. Significant resource issues to be approved by CBU leads.

In house regimen
Where there is no suitable approved regimen, trial or guideline available a regimen may be chosen based on evidence in the literature and clinical national and international experience. In these circumstances a CDEG application must be made.

All CDEG applications are discussed at the chemotherapy group meeting. Application for inclusion of Alder Hey approved regimens into the Network approved list, will be made by lead pharmacist.

5.5.2 Chemotherapy 'off protocol' prescribing.

In exceptional circumstances, it may be necessary to treat a patient with a protocol not on the current list of accepted Network Chemotherapy Regimens.

This situation may arise, for example:
- in a patient for whom none of the current network approved regimens are appropriate due to pre-existing organ toxicity
- the cancer being treated is rare, and there isn't an existing specific protocol
- a patient has responded to several previous courses of treatment and for whom further chemotherapy is justified but no specific protocol exists
- New evidence for a drug/regimen has become available or new license agreed

The requesting clinician should complete a CDEG application plus;

- A New Drug Request if the drug has not been approved for use in the trust previously (for any indication). Significant resource issues to be approved by CBU leads.

- In more urgent circumstances the consultant must approach, the senior pharmacist, CBU leads, director of finance if appropriate and chair of CDEG for approval. CDEG approval must be sought retrospectively as soon as possible.

The oncology pharmacist will record off protocol treatments on the non approved regimens list with brief details. The list will then be reviewed at the

PTC Chemotherapy Group.

Off protocol or non network approved regimens must be reported to the Merseyside and Cheshire Cancer Network (MCCN).

- The cancer network chemotherapy group will annually review all off protocol chemotherapy prescribing.

5.6 Prescribing a cycle of chemotherapy

Each cycle of chemotherapy, including essential supportive treatment, must be prescribed on a separate prescription chart.

It essential that critical test dependant cycles are written on a separate prescription chart.

The complete cycle of chemotherapy must be prescribed to ensure no doses are missed. Always refer to the original treatment protocol when prescribing a chemotherapy prescription and take note if dose modifications are required because of age or previous toxicity.

For complex regimens that are not on Chemocare a prescribing summary may be available, this will be found in the front of the protocol file in the MDT office. The summary is to support the information in the protocol (e.g. sequence of administration, hydration) but does not replace it – always refer to original protocol.

5.6.1 Prescription sheets

Chemotherapy can be prescribed on the following prescription sheets:

a. Chemocare electronic standardised prescriptions.
b. Intravenous blue cytotoxic prescription

Page	Drugs
Front	Non cytotoxic, as required drugs and regular drugs given intermittently, directly associated with administration of chemotherapy e.g. antiemetics
Inside left	Cytotoxic bolus doses. NB Bolus doses making up a course of treatment should be

	prescribed on the same line of the prescription. For doses more than a day apart draw a box for each dose and mark the date clearly above the box. Bolus doses for separate courses or where the date of prescribing differs must be prescribed on a separate line and must not be added to. Infusions ≤ 15 minutes duration, Infusions more frequently than once a day. Intravenous supportive therapy directly associated with administration of chemotherapy e.g. Mannitol, frusemide, calcium folinate, and mesna boluses
Inside right	Cytotoxic infusions, given once a day and intravenous infusions/ hydrations
Back	Intravenous infusions/ Hydrations continued

c. Oncology intrathecal prescription sheet
d. General prescription sheet – inpatient for oral, and IM, or SC (unless prescribed on a Chemocare standardised prescription)
e. Discharge summary/prescription
f. Outpatient prescriptions
g.Protocol specific standardised prescription sheets e.g. ALL maintenance
h. Community administration record…..
i. Clinical trial prescription if provided.

i) In-patient/day case cytotoxic drug therapy

Parenteral cytotoxic drug therapy and related intravenous therapy (e.g. folinic acid rescue, hydrations) must be prescribed on Chemocare computer generated prescriptions if available. NB anti-emetics must be prescribed on the green intravenous prescription or general prescription sheet.

If the regimen is not on Chemocare, intravenous cytotoxic drug therapy and related intravenous therapy including anti-emetics must be hand written on the blue intravenous cytotoxic prescription sheet (see section 5.6.1).

Oral cytotoxic drug therapy must be prescribed on the general prescription sheet.

Subcutaneous and intramuscular cytotoxic drug therapy must be prescribed on Chemocare standardised prescriptions if available. Otherwise prescribe on the general prescription sheet.

Intrathecal therapy must only be prescribed on the Chemocare Intrathecal prescription sheet or Oncology intrathecal prescription sheet.

ii) Cytotoxic drug therapy to be given at home or POSCU.

Cytotoxic drug therapy to be given at home or a POSCU must be prescribed on an out patient or discharge prescription. All chemotherapy is dispensed from Alder Hey pharmacy.

In addition a Community/Shared Care Administration record must be completed for intravenous cytarabine. This record form gives authority to administer the medication prescribed in the community or at a POSCU.
An oral chemotherapy record must be completed by the prescriber for patients having oral treatment at home. The record contains contact details for specialist information and advice and the name of the patient's consultant. The record will also indicate the treatment plan: the name of the treatment regimen, stage of protocol, blood count results, oral chemotherapy prescribed including duration of treatment.

5.6.2 Prescription requirements (parenteral or oral)

The following information is required in addition to that detailed in section 5 of the Medicines Management code. This information must be on the prescription or accompanying chemotherapy checklist.

Prescriptions MUST be printed on a ChemoCare prescription if available or written IN BLACK INK IN BLOCK LETTERS.

a. Identification of patient

   The patient's name, weight, surface area, unit number (including NHS number), date of birth and consultant must be written at the head of the prescription sheet and on any continuation sheets. A label may be used to supplement this information.

   Check weight and surface area appropriate for age

b. Ward area where drugs are to be given

c. Identification of Clinical trial/ protocol, cycle and diagnosis

The protocol name and cycle number must be written at the head of the prescription sheet.

It is the prescribers' responsibility to identify that the patient is on a clinical trial. All prescriptions that include IMPs written for patients enrolled on a clinical trial should have a label on the prescription to identify that the patient is on the clinical trial. The labels are pre-printed by the oncology data managers and kept in the patients notes. For example:

*** CLINICAL TRIAL***
Protocol:
EudraCT :
Investigator:
PtTrial Number:

The prescriber must write IMP underneath the drug name.

d. Start date

For handwritten chemotherapy prescriptions that are count dependent indicate the date treatment is due to start in pencil.

Once the start date is confirmed, the date must be written in black ink by an authorised prescriber (see 1) or oncology pharmacist. If the date is changed this must be checked by an authorised prescriber, ANP or oncology pharmacist.

e. Drug or medicine

If handwriting the prescription print clearly in full, using block capital letters, the names of all drugs prescribed. Use the approved name wherever possible.

Abbreviations for names can be confused and must not be used (e.g. MTX for methotrexate). The brand name should be used when differences in bioavailability may be important (e.g Roaccutane).

f. Dose

Ensure correct dose is calculated. Round dose sensibly to allow ease of preparation

Do not use trailing Zero after decimal a point
(e.g. 7.0)

A leading zero must always precede a decimal point (i.e. 0.7).

Roman numerals (e.g. ii) must not be used,

Refer to dose modification details in the protocol.

g. Route and method of administration

The route of administration must be specified on the general prescription sheet. Intravenous, intravenous cytotoxic or intrathecal cytotoxic drugs MUST be prescribed on their own, separate sheets refer to 6).

If a specific intravenous central line should be used indicate as Line A or B

h. Times for administration

Indicate administration time using T = x hrs (ranging from T = 0 hrs to T = 24 hrs).

If the start time of chemotherapy is essential this should be noted clearly on the prescription using 24-hour clock (start 00:00). For infusions written on the blue intravenous cytotoxic prescription this should be on the LHS of the drug entry line, or in the comments box on a ChemoCare prescription.

The sequence of administration should be indicated for complex treatments written on the blue intravenous cytotoxic prescription. Sequence 1,2,3 etc, and for drugs to be given at the same time add a, b or c.

i. Special instructions

The prescriber should include appropriate additional information if required to contribute to safe and effective medicine administration.

Examples:

Drug	Instruction
Mesna hydrations	Start with Cyclophosphamide (or

	ifosfamide)
Ifosfamide/Cyclophosphamide infusions	Start with mesna hydration
Methotrexate	Take levels at ……..hr post start of infusion
Sodium bicarbonate hydrations or Calcium leucovorin	Continue until Methotrexate level < ……micromole/ml
Cisplatin	If Urine output falls below …….give……
Various	Y site with ……
Various	Dose ↓ X %
Various	Phone cytotoxic unit when required.
Various	Location of treatment if shared care unit to administer chemotherapy

j. Modification of prescription

The start date may be changed on a hand written chemotherapy prescription once only. Draw a single straight line through the date and write the new date clearly alongside. Initial the date change. The prescription may need to be rewritten if unclear.

The date may be changed twice on a Chemocare prescription but only once on an intrathecal chart.

Date changes can only be done by an authorised prescriber or oncology pharmacist.

Chemotherapy prescriptions may be modified if this can be done clearly. Draw a single straight line through the item to be modified and write the change clearly alongside. Initial and date the modification

New prescriptions or amendments to a prescription, which are made and signed by a pharmacist after consultation with the prescribing doctor, are acceptable. The doctor should endorse these as soon as possible.

The pharmacist may endorse the prescription with instructions, calculations or advice.

Any amendments to the prescriptions (including outpatient and discharge prescriptions) must be recorded in the patient's case notes.

k. Prescription Check

Any prescription, which is incorrectly or incompletely written, must not be dispensed or administered to the patient.
The pharmacist and/or nurse must ensure that the prescription is correct before either supplying or administering the Chemotherapy.

l. Incorrectly written prescriptions

IT IS THE DOCTOR'S RESPONSIBILITY TO ENSURE THAT PRESCRIPTIONS ARE WRITTEN CORRECTLY AND IN ACCORDANCE WITH THE ABOVE REQUIREMENTS.

m. Re-writing of prescriptions

All prescribers must ensure that the prescription sheet is legible and understandable. This may require that the prescription sheet is re-written.

The prescriber must rewrite the Chemotherapy prescription if the pharmacist and/or nurse consider it to be illegible or unclear. This may cause a delay in therapy preparation. If a delay is envisaged the patient's consultant must be informed and if necessary the time of patient admission rearranged.

Prescribing for the prevention/treatment of regimen specific complications

For guidance on the use of **antiemetic** and **GCSF** (recombinant granulocyte colony stimulating factor) refer to separate guidance, in the therapeutic guidelines section on Trust intranet.

(i) Intravenous Pre and Post Hydration Fluids

Chemotherapy that has renal or uroepithelial toxicity requires accompanying intravenous hydration to ensure an adequate fluid through put. The following drugs must be given with intravenous hydration **ALWAYS refer to specific protocol for details**:

- Cisplatin
- Ifosfamide
- Cyclophosphamide at daily doses > $1g/m^2$
- Methotrexate at doses > $1g/m^2$
- Melphalan

Hydration may also be required to prevent a build up of toxic breakdown products of tumour cells. (See Acute Tumour Lysis Guidelines for treatment and management, in therapeutic guidelines on Trust intranet) or in patients who have an inadequate oral intake during any chemotherapy (in addition to the drugs noted above).

Recommended fluids generally include the following to which there may be additives:

- 5% dextrose + 0.45% sodium chloride
- 2.5% dextrose + 0.45% sodium chloride + potassium chloride 20mmol/L
- 5% dextrose + 0.45% sodium chloride + potassium chloride20mmol/L
- 2.5% Dextrose/0.45% sodium chloride + potassium chloride20mmol/L, + Magnesium Sulphate 10mmol/L + Calcium Gluconate 0.6mmol/L

MANNITOL is added to **CISPLATIN** hyper-hydration to force diuresis and minimise renal damage. Frusemide can exacerbate renal toxicity with cisplatin and increase electrolyte loss. Fluid balance should therefore be maintained with additional mannitol. Where possible standard electrolyte hydration fluids containing magnesium, potassium and calcium (as detailed above) should be used as hydration for cisplatin. Refer to specific protocol for details.

(ii) Hydration Rates

Hydration is usually given at a rate of 2000- 3000ml/m^2/24 hours (84-125ml/m^2/hr), taking into account the fluid volumes of the chemotherapy. Hyper-hydration with 200ml/m^2/hr for 3-4 hours may be required to pre-hydrate patients having cisplatin or melphalan. The fluid chosen should have sufficient sodium content to avoid hyponatraemia and potassium to prevent hypokalaemia.

This may change according to compatibility of chemotherapy and fluids, or individual patient haemodynamics. Hydration bags contain up to 3000mls. For quantities > 3000ml/24 hours the daily hydration fluid will be split into 2 equal bags. When prescribing hydrations on the blue intravenous cytotoxic prescription ensure there is enough space for the nurse to sign for each bag administered. If necessary write the hydration up for subsequent days.
Cap the volume of fluid per day to approximately 4500ml unless otherwise stated in the protocol or as clinically indicated.

Hydration above maintenance requirements can lead to fluid overload. Monitor fluid balance, allowing for bed wetting and vomiting or watery diarrhoea and check that there is adequate urine output. Frusemide IV (0.5mg/kg) may be necessary to maintain output (unless specifically contraindicated).

It is essential that children receiving ifosfamide or higher dose cyclophosphamide pass urine at least every 4 hours, as this minimises bladder toxicity. They should be encouraged to pass urine, and if necessary frusemide should be given.

Renal function should be monitored routinely throughout chemotherapy with hydration. A daily electrolyte and serum creatinine check should be sufficient in most cases.

(iii) Use of Mesna

MESNA is added to prevent urothelial toxicity. It is given whenever ifosfamide is given and also in regimens where the cyclophosphamide dose exceeds 1g/m^2.

- Intravenous hydration with a dextrose /saline solution (usually 2.5% dextrose/ 0.45% sodium chloride with potassium chloride 20mmol/L) with potassium chloride) containing mesna at 120% (mg/mg) of the prescribed daily cyclophopshamide or ifosfamide dose. Infuse this solution at 125ml/m^2/hr starting 3hours before the first cyclophosphamide/ifosfamide dose and continuing for a minimum of 12 hours after completion of the last cyclophosphamide/ifosfamide dose.

If dose of **cyclophosphamide < 300mg/m^2/day** then mesna and IV hydration are not required providing there is adequate oral fluid input and micturition is encouraged.

For doses **cyclophosphamide 300 mg / m^2 to 1 g / m^2** no mesna is required. IV hydration is given at 125 mls/m^2/hour commencing with or before the first cyclophosphamide dose and continuing for at least six hours after last cyclophosphamide dose.

Where there are compatibility issues it may be necessary to interrupt the mesna hydration and give boluses of mesna. Contact the oncology pharmacist for advice.

When prescribing mesna refer to the original protocol. If this differs to the above discuss with the oncology pharmacist or consultant before prescribing

If a patient develops haematuria whilst receiving cyclophosphamide or ifosfamide

- Check the fluid regimen to ensure that they are receiving intravenous hydration at rate of 3000 mL/m^2/day (125 mL/m^2/hr). Check with consultant before increasing fluid to more than 4500mL per 24 hours.
- Ensure that they have received Mesna as per the guidelines outlined in their specific protocol.
- Start mesna if required.
- If a child develops haematuria and is already receiving mesna at the appropriate dose then increase the total daily dose to 160%. Give the additional total daily dose of mesna required as a bolus in 4 divided doses every 6 hours. Increase fluid rate as described above.

(iv) Supportive therapy for High Dose Methotrexate

SODIUM BICARBONATE is given with **HIGH DOSE METHOTREXATE** to maintain a urine pH > 7 throughout the methotrexate infusion and during the **CALCIUM LEUCOVORIN RESCUE**. Both drugs are essential to ensure excretion of the methotrexate and rescue of the normal cells. **ALWAYS refer to specific protocol for details as this varies depending on dose and duration of administration of methotrexate.**

Failure to excrete methotrexate, particularly if caused by renal impairment, may necessitate the use of **carboxypeptidase G2, (Voraxaze™)** in addition to

leucovorin. This contains glucarpidase, a recombinant enzyme which rapidly breaks down methotrexate in the blood. The consultant should contact pharmacy to arrange supplies.

(v) Prevention of serious hypersensitivity reaction

The following chemotherapy drugs are known to cause allergic reactions, but any individual may react to any drug or excipient.

DRUG	**MOST COMMON REACTION**
Asparaginase	Type 1 (rash), progressing to type 3 (anaphylaxis & bronchospasm) reactions.
Bleomycin	Fever and respiratory complications. Rare hyperpyrexia syndrome.
Cytarabine	Flu like syndrome
Etoposide	Type 1 (rash), progressing to type 3 (anaphylaxis & bronchospasm) reactions.
Cisplatin, carboplatin	Late onset rashes. Re-challenge may lead to bronchospasm and anaphylaxis
Procarbazine	Type 1 allergic rashes. Mild Monoamine-oxidase type reactions have been reported if taken concurrent with tyramine containing foods
Rituximab	Mouse derived protein reactions. Pre-medicate with steroid and antihistamine. Slow infusion if hypotension occurs.
Antithymocyte globulins	Rabbit derived protein reactions. Pre-medicate with steroid and antihistamine.
Campath (alemtuzumab)	Humanised monoclonal antibody. Due to abrupt release of cytokines premedication required with steroid, antihistamine paracetamol and pethidine
Mifamurtide	Mifamurtide is classed as an immunomodulatory drug rather than a cytotoxic drug. Mifamurtide can cause allergic reactions, fever and chills. Pre-med with oral paracetamol. Chills and rigors commonly occur after administration and these may be treated with paracetamol first line and then with Pethidine. The chronic or routine use of corticosteroids should be avoided during treatment with mifamurtide.

To prevent serious hypersensitivity reactions pre medication must be prescribed if indicated. Refer to specific guidance in relevant clinical guideline for Rituximab and Antithymocyte globulin premedication, contact oncology

pharmacist for advice.

For further information on prevention and treatment MCCN Network Guidance for the Prevention and Management of Acute Hypersensitivity Reactions (available on oncology k drive)
They are also accessible on the MCCN website via the following link: http://www.mccn.nhs.uk/userfiles/documents/05%20%20MCCN%20Prevention%20and%20Management%20of%20Acute%20Hypersensitivity%20Reactions_June06_revMar08.pdf and the Trust dose guide and algorithm contained within the Anaphylaxis kits, available in each clinic area.

5.7 Intrathecal therapy

Refer to the Medicines management code, Policy on the Management of Intrathecal Cytotoxic Drugs

5.8 Forgotten /misplaced prescriptions

Vincristine prescriptions written or given to the pharmacist on the morning treatment is due will be available by 2.30pm

Intrathecal prescriptions written or given to pharmacist on the morning treatment is due will be prepared as soon as possible. N.B. This may delay preparation of other treatments for that day and the next day including day case.

Deadlines for prescribing parenteral chemotherapy must be adhered to.

5.9 Additional records, documentation and Communication required

5.9.1 Chemotherapy clinical/ monitoring pre chemotherapy checklist

a) **Deadline for regimen specific critical test results**

With the exception of newly diagnosed patients regimen specific critical test results must be available 2 days prior to chemotherapy so that treatment can be prepared in advance.

Parenteral chemotherapy for newly diagnosed/relapsed patients (only) must have regimen specific critical tests confirmed by 2 p.m. on the day treatment is due.

Where the regimen specific critical test result is not available until after the above deadline treatment may be delayed. The oncology pharmacist, senior nurse and advanced nurse practitioner must be consulted to arrange preparation and administration of chemotherapy. If a delay in therapy is envisaged the patient's consultant must be informed and the time of patient admission rearranged.

b) **Chemotherapy clinical checklist**

A chemotherapy clinical checklist (for handwritten parenteral prescriptions) or the monitoring checklist for treatment prescribed on ChemoCare, must be completed at the time of prescribing.

This documentation is not required for parenteral cytotoxic drug therapy due in clinic and theatre nor for single agent vincristine therapy unless part of the ChemoCare prescription.

All sections on the checklist must be completed where possible at the prescribing stage. It is the responsibility of the prescriber to ensure that all appropriate investigations/monitoring have been requested. Refer to the original protocol, treatment plan and diagnostic work up sheets for further information.

Results of all investigations may not be available at the prescribing stage. When results are available the checklist must be completed.
Checklist need to be completed two days before treatment is due so that treatment can be made.

Records of complications, side effects, toxicity, treatment delays dose modifications and protocol deviations and whether permanent should be recorded on the chemotherapy clinical checklist (for handwritten parenteral prescriptions) or in the box on the front page of a ChemoCare prescription.

The oncology pharmacist must be informed immediately a decision to go ahead with chemotherapy has been made.

When a patient is admitted to the oncology unit for chemotherapy the doctor or advanced nurse practitioner that clerks the patient must ensure that the checklist is completed in full.

5.9.2 Case notes

The protocol/randomisation should be clearly recorded in the patient's case notes together with a copy of the protocol flow chart if applicable.

A record of all chemotherapy should be made in the patient's notes including the protocol, randomisation (if applicable), course number, drugs and doses given. Records of complications, side effects, toxicity, treatment delays dose modifications and protocol deviations and whether permanent should also be recorded in the case notes.

5.10 Ordering chemotherapy

Parenteral chemotherapy prescriptions for in-patient, day case and theatre administration should be placed (together with the cytotoxic drug therapy clinical checklist and case notes if appropriate) in the prescription tray above the oncology pharmacists desk in the Multidisciplinary office on the first floor of the oncology unit.

Oncology clinic parenteral chemotherapy prescriptions should be placed in the clinic prescription box at the oncology unit's reception. The oncology pharmacist will collect these prescriptions.

Parenteral chemotherapy take home prescriptions for patients due in-patient/day case therapy should be kept with the in- patient /day case chemotherapy prescription. When a decision has been made to go ahead with therapy the Advanced Nurse Practitioner must arrange for the 'take home' prescription to be delivered to pharmacy (dispensary).

Oral chemotherapy should be ordered from pharmacy in the same manner as other drug therapy. Where oral therapy is prepared from a parenteral formulation (e.g. oral liquid etoposide and liquid cyclophosphamide) the prescribing deadlines must be adhered to

Where treatment is required urgently the oncology pharmacist should be contacted to discuss preparation.

6. PRESCRIPTION CHECK, AUTHORISATION AND ENDORSEMENT OF CHEMOTHERAPY PRESCRIPTIONS BY A PHARMACIST.

This document should be read in conjunction

- Medicines Management Code

- Clinical Pharmacy Services Procedure for endorsement of in-patient prescriptions
- Pharmacy Clinical Trial Procedures
- Oncology Pharmacy Clinical Trial Procedures

All chemotherapy must be checked and authorised by a pharmacist

6.1 Check and authorisation of all parenteral chemotherapy.

This also applies to oral chemotherapy prescribed as part of a cycle of in-patient or day case chemotherapy.

All parenteral chemotherapy is checked and authorised by a paediatric oncology trained pharmacist. A list of paediatric oncology trained pharmacists is kept on the oncology K drive.

The pharmacist must clinically check the chemotherapy prescription in accordance with the clinical trial, treatment guideline or protocol.

- Check prescribers details and signature are present and confirm they are authorised to prescribe chemotherapy
- Ensure regimen is included on a list of network (local) approved regimens. If not then the "off protocol" process described above should be followed
- On the first cycle check the regimen is the intended treatment as documented in a treatment plan, in the clinical notes or in the electronic record
- Check regimen is appropriate for patient's diagnosis, medical history, age, performance status and chemotherapy history (using the treatment plan, clinical notes or electronic record)
- Check there are no known drug interactions (including with food) or conflicts with patient allergies and other medication(s)
- Check that the timing of administration is appropriate i.e. interval since last treatment, sequence of administration
- Check patient demographics (age, height and weight) have been correctly recorded on prescription

- Check body surface area (BSA) is correctly calculated, taking into account recent weight (within last four weeks).
- Check all dose calculations and dose units are correct and have been calculated correctly according to the protocol and any other relevant l guidance
- Check cumulative dose, if appropriate
- Check reason for any dose adjustments, e.g. reduction(s) and ensure reason is documented
- Check appropriate dosage adjustments made for age or toxicity
- Check method of administration is appropriate
- Check laboratory values, FBC, U&E's and LFT's are within accepted limits if appropriate
- Check doses are appropriate with respect to renal and hepatic function and any experienced toxicities
- Ensure prescription is accurate and unambiguous, legible and clear
- Check other essential tests have been undertaken if appropriate
- Check supportive care is prescribed and it is appropriate for the patient and regimen
- If the patient is on a clinical trial ensure prescribed in accordance with clinical trial legislation. Refer to Pharmacy oncology clinical trials SOP and pharmacy trial summary.
- Ensure policy on prescribing cytotoxic drug therapy for malignant conditions has been adhered to.
- Endorse the prescription if required to contribute to safe and effective medicine administration.
- Sign and date prescription as a record of verification.

  Chemocare prescriptions: sign (full signature) in the pharmacist signature box and date on each page. In addition the pharmacist can initial in small letters next to the comments box in each drug line to confirm each line has been checked.

  Outpatient or discharge prescription: Endorse on left hand side of each drug entry with initials. Endorse 'Cytos' on the right in the supply box when a supply from the cytotoxic unit has been organised.
- Ensure critical test results are recorded on clinical/monitoring pre chemotherapy checklist and sign when results are available

6.2 Oral Chemotherapy

Oral chemotherapy that is prescribed from clinic will be checked and authorised by a dispensary trained pharmacist (training includes supervised experience in checking and dispensing chemotherapy).

The clinical/dispensing pharmacist will confirm that the prescribed drug and dose is appropriate for the patient by consulting the original protocol or protocol summaries, and patient's oral chemotherapy record as appropriate.

The clinical/dispensing pharmacist will check and sign the patient's oral chemotherapy record. Dispensing staff will include the number of days treatment as part of the label directions. For treatment of a fixed duration a note 'then stop' will be included on the label. The dispensing pharmacist should seek advice from an oncology pharmacist or other oncology staff as necessary.

Pharmacy staff should counsel the patient and or carer and where the patient and or carer is unsure about any aspect of treatment or monitoring they should be referred back to the prescriber.

Prescriptions for oncology patients written by non-specialists or junior doctors will be referred to a specialist prescriber and a clinical incident form completed.

7. PREPARATION

All preparation of cytotoxic injections, and suspensions must be carried out in pharmacy (with the exception of Asparaginase). Tablets and capsules must not be broken, or crushed unless within the controlled environment of pharmacy. If tablet segments are required these will be made in pharmacy.
Parenteral cytotoxic drugs are prepared under controlled conditions (using strict aseptic technique) in the Cytotoxic Preparation Unit. The cytotoxic preparation unit is part of the Alder Hey Children's NHS Foundation Trust Aseptic Unit. For further details refer to the Pharmacy Aseptic Procedures.

The Aseptic Unit is independently, externally audited by the QCNW (North West Regional Quality Assurance department). Audit findings are discussed with the lead oncology pharmacist and a report made to the Chief Pharmacist and Chief Executive who are required to respond with an action plan.

A weekend and oncall service is available removing the need for preparation outside this controlled environment. Refer to out of hours chemotherapy section of this policy for further information.

For preparation of cytotoxic drugs used within a clinical trial refer to the Pharmacy Clinical Trials procedures and Pharmacy Oncology Clinical Trials procedures.

The pharmacy chemotherapy service will be reviewed annually with the trust COSHH advisor against current COSHH regulations. Any residual risk will be reported to the Trust risk manager and included in the risk register if necessary.

8. PRESENTATION, LABELLING, PACKAGING

All parenteral cytotoxic drugs will be provided in a container suitable for direct administration to the patient.

All bolus injections will be provided in luer lock syringes with the exception of intrathecal drugs which will be luer slip to fit the lumbar puncture needle. Drugs intended for infusion will be prepared in infusion bags (PVC, EVA, Viaflo), medication cassettes, glass bottles or syringes as appropriate.

All labelling must comply with the relevant statutory and professional standards. Labels will contain the following information: Approved name of drug, quantity and strength, vehicle containing the drug if appropriate, final volume, route of administration, preparation date, expiry date and batch numbers, appropriate cautionary notices, storage requirements, name of patient, name and address of pharmacy, location, wording to indicate cytotoxic e.g 'conform to cytotoxic policy' or a 'CYT' label

Vincristine will be labelled ' Warning for intravenous use, fatal if given by other routes'.

Intrathecal drugs – refer to the Medicines Management Code, Policy on the Management of Intrathecal Cytotoxic Drugs

All cytotoxic injections and infusions that need to be protected from light during administration will be supplied in amber syringes, covered with foil or will be placed in light protective bags as appropriate.

Individual parenteral doses will be packaged in a yellow heat sealed plastic sleeve so that, in the event of leakage/breakage, solution is contained within the sleeve. For patients having treatment at home the doses will also be sealed in a cytotoxic transport bag.

All oral cytotoxic drugs will be provided in child resistant containers or blister packs as appropriate. All labelling must comply with the relevant statutory and professional standards. Oral chemotherapy for in-patient use only will have an additional 'CYT' label. Treatment will be placed in sealable plastic bags. Suspensions will be double bagged.

For labelling of cytotoxic drugs used within a clinical trial refer to the Pharmacy Clinical Trials procedures and Pharmacy Oncology Clinical Trials procedures.

9 TRANSPORTATION/DELIVERY

9.1 Within the hospital

(i) Parenteral cytotoxic drugs
Personnel involved in transporting cytotoxic drugs should follow the instructions on the warning label attached to the delivery box (refer to spillage guidelines section 15).

Parenteral cytotoxic drugs must be transported in designated rigid, security sealed containers labelled:-
CAUTION CONTAINS CYTOTOXIC DRUGS.
SPILLAGE. If spillage occurs during transport: isolate the spillage site, remove hazard warning sign from the wallet attached to the side of the transport box and place in a clearly visible position. Contact the pharmacy cytotoxic unit or oncology ward immediately.

With the exception of intrathecal hydrocortisone and supportive therapy (e.g. hydrations, mesna) for patients receiving cytotoxic drugs, parenteral non cytotoxics drugs should not be transported in the same container as cytotoxic drugs.

There are designated parenteral cytotoxic transport boxes:-

(i) For intrathecal preparations only, Refer to the Medicines management code, Policy on the Management of Intrathecal Cytotoxic Drugs

(ii) For ward and day care deliveries.

Inpatient and day care chemotherapy will be delivered by the pharmacy staff at the following time:

9.15 am (9.00am on Wed/Thurs), 11.30am, 2pm and 4.30,

If a delivery is required outside these times it may be necessary for the Oncology Unit staff to collect treatment from the cytotoxic preparation unit.

On delivery the parenteral cytotoxic box (es) should be opened immediately and contents stored in accordance with the instructions on the label.

(ii) Oral cytotoxic drugs

Oral cytotoxic drugs will be transported in a security sealed pharmacy cytotoxic ward transport bag labelled CAUTION CONTAINS CYTOTOXIC DRUGS. Guidance is given on action to take in the event of a spillage.
On delivery the pharmacy ward transport bag should be opened immediately and contents stored in accordance with the instructions on the label.

9.2 From the hospital

Patient's parents/carer will normally be responsible for transporting cytotoxic therapy to be administered at home. A nurse may transport the cytotoxic drug therapy provided it is concealed (e.g. locked in car boot) in a separate rigid plastic container.

10 STORAGE

10.1 Within the hospital

Stocks of cytotoxic drugs must be kept in pharmacy and stored in accordance with the manufacturer's instructions. They must be stored in a separate area which is clearly marked "Cytotoxics". For further details refer to Pharmacy Cytotoxic Procedures.

Supplies of cytotoxic drugs temporarily kept in a clinical area pending administration to a patient are the responsibility of the nursing staff. Attention must be paid to label storage instructions (e.g. store in refrigerator).

Parenteral cytotoxic drugs stored within the oncology unit must be stored in a dedicated refrigerator within a locked room. The refrigerator must be continually monitored for correct temperature. (2 to 8^0C). Room temperature products are stored in a locked cupboard.

Oral cytotoxic drugs are only kept temporarily on the oncology unit and are stored in a lockable medicines trolley or in a refrigerator within a locked room.

All investigational medicinal cytotoxic drugs that are unlicensed must be kept in a designated clinical trial plastic box and stored as indicated above in accordance to Good Clinical Practice requirements.

It is the responsibility of the nursing staff to ensure they are stored appropriately. Storage should be closely monitored by pharmacy staff.

For storage in pharmacy of cytotoxic drugs used within a clinical trial refer to the Pharmacy Clinical Trials procedures and Pharmacy Oncology Clinical Trials procedures.

10.2 Within the home

In the home, parents/carer should be advised to store cytotoxic drugs in accordance with the instructions on the label, in a safe place, out of the reach of children and away from food. If cytotoxic drugs need to be stored in a refrigerator they should be stored on the bottom shelf of the refrigerator, or where they will not easily be knocked off, preferably in a plastic storage box away from food and out of the reach of children.
Appropriate written and verbal information will be provided to patients.

11 GUIDELINES FOR ADMINISTRATION OF CYTOTOXIC DRUGS

11.1 Introduction

The aims are to:

- Protect both the cytotoxic drug administrator and the patient from contamination,
- Prevent extravasation of drugs which could cause tissue damage
- Ensure administration is appropriate.

In addition to the following guidelines, nursing staff should follow Alder Hey Children's NHS Foundation Trusts Medicines management code.

Oral, intramuscular and subcutaneous cytotoxic drugs

Oral, intramuscular and subcutaneous cytotoxic drugs may be administered to patients by trained nursing who are aware of all procedures cited in the 'Operational Guidelines on the use of Cytotoxic Drugs'.

Intrathecal cytotoxic drugs

Intrathecal cytotoxic drugs must be administered by a Consultant, specialty doctor or Specialist Registrar trained specifically to carry out the procedure. (ST3 doctors will only be considered for training if they are attached to the oncology unit for more than 6 months). Intrathecal therapy administration must be checked by a nurse or ODP (trained to check the administration of intrathecal therapy) and the administering doctor. Both must sign the Intrathecal Prescription in full. Refer to the medicines management code, 26.17 Policy on the Management of Intrathecal Cytotoxic Drugs

Intravenous cytotoxic drugs

Intravenous cytotoxic drugs may be administered to patients only by nursing staff who have received appropriate training. Nurses working within the oncology unit must have extended their role in intravenous therapy according to Trust medicines management code 14 Management of Injectable Therapy and Infusion Systems and completed the recognised chemotherapy training package.

11.1.1 Training to administer cytotoxic drugs should include:-

For Primary Treatment Centre Nursing Staff (Oncology)

Eight hours of theoretical training followed by two workbooks and practical

assessment. Training program accessible on Oncology K drive (Communications folder – Chemotherapy training and annual updates).

For Primary Treatment Centre Medical staff (Specialist Grade or above)

For the POSCU (and community Staff) dealing with oncology patients
6 hours of theoretical training followed by one work book and practical assessment relating to the potential treatment they may be administering. The nurses will receive theoretical support from the Primary Treatment Centre which is where the workbook will be assessed. Practical assessment will occur locally either by another paediatric nurse who is competent in chemotherapy administration or an adult colleague competent in chemotherapy administration.

Updates should be maintained annually as a minimum requirement and more frequently when changes in practice have been indicated.

A register of all staff that have completed the chemotherapy training is kept on the Oncology K drive (Communications folder – Chemotherapy training and annual updates).

11.1.2 Verification procedure prior to administration

Prior to administration of chemotherapy the following aspects need to be checked:
Patient identification
Critical test results
Regimen and individual drug administration
Diluents and dilution volumes and any hydration
Supportive drugs given as prescribed
Administration routes and duration appropriate
Cycle number
Appropriate timing of administration
This information is recorded on the chemotherapy drug therapy clinical checklist or monitoring check list on Chemocare prescriptions.

11.2 GUIDELINES FOR ADMINISTRATION OF INTRAVENOUS CYTOTOXIC DRUGS VIA CENTRAL VENOUS LINE

Administration in hospital

A: Actions prior to the administration of chemotherapy

Action	Rationale
1. Read Cytotoxic Prescription Chart and complete the Cytotoxic Therapy Clinical Checklist if appropriate prior to commencing.	1. To ensure all relevant information has been considered prior to starting treatment.
2. Explain the procedure to the child and family.	2. To obtain the child and family's consent and co-operation.
3. Administer appropriate supportive therapy before chemotherapy administration;	3. To reduce the side effects of treatment.
e.g. antiemetic,	To prevent nausea and vomiting.
mesna,	To prevent haemorrhagic cystitis.
hydration.	To increase urine output and prevent renal toxicity.

B: Preparation of infusion devices necessary for administration of Chemotherapy.

Action	Rationale
1. Using an Aseptic Non Touch Technique (ANTT) prepare infusion sets if required and administration devices prior to commencing cytotoxic drug administration.	1. To establish a vehicle for cytotoxic drug administration.
2. Infusion sets should be primed with non cytotoxic infusion fluid before the cytotoxic drug container is connected. The fluid should be compatible with the cytotoxic drugs to be given.	2. To avoid the release of cytotoxic drugs into the environment.

3. Infusion sets with air vents, e.g. burette sets should not be used for the administration of cytotoxic drugs.	3. To avoid leakage of cytotoxic drugs into the environment.
4. Cytotoxic drugs should not be filtered unless specifically requested.	4. Data may not be available regarding filtration of many cytotoxic drugs.

C: Administration of cytotoxic drugs

Action	**Rationale**
1. Collect cytotoxic drug packages required together in a clean, uncluttered area.	1. To prevent contamination and error.
2. Using an ANTT prepare the necessary equipment for administration.	2. To Maintain an aseptic technique and to prevent local and / or systemic infection.
3. Put on additional protective clothing if preferred prior to handling any syringes or infusion bags filled with cytotoxic drugs.	3. To protect the cytotoxic drug administrator from local contamination of skin.
4. Check drug details according to the Medicines Management code	4. To ensure that the child is given the correct drug and dose prepared.
5. Transport cytotoxic drugs to the patient in a shallow plastic container. Administration of drugs should be carried out over this container.	5. To contain any spillage in an enclosed area.
6. Work at waist level. Avoid working above the head or reaching up for connections or ports. If this is necessary safety goggles are advised.	6. To prevent contamination of the administrator or patient from spray around the face in the event of spillage.
7. Check for patency of CVL by obtaining a flashback of blood.	7. To ensure that those agents likely to cause tissue damage are given when

Administer drugs in the correct order, following sequence of administration prescribed. The most vesicant agents are usually delivered first.	venous integrity is greatest, and that chemotherapy protocol is adhered to.
8. Flush the central line between drugs and after administration with fluid compatible with the cytotoxic drug.	8. To prevent drug interaction.
9. Ensure the correct administration speed of the infusion or injection.	9. To prevent toxicity.
10. Be aware of the immediate effects of the drugs being given.	10. To ensure side effects are recognised and managed appropriately.
11. Protect the child and administrator from contact with drugs. a) Attach administration sets with care. b) Attach luer lock connection of syringe directly to central line. c) Take care when inserting the infusion set into the infusion bag and when changing bags.	11. To avoid spray or leakage and contamination of the chemotherapy administrator and child.
12. Administration sets should be monitored for leakage throughout the duration of the cytotoxic drug administration. Portacath needles should be checked regularly to ensure correct placement and patency.	12. To detect any problems of leakage or extravasation at the earliest moment.
13. Observe for signs of extravasation. (see guidelines for prevention and treatment of cytotoxic drug extravasation)	13. To detect any problems of leakage or extravasation at the earliest opportunity.
14. Act promptly if any contamination is noted, following guidelines for 'Dealing with Cytotoxic Spillage'	14. To prevent any local reaction on skin or mucous membranes, and minimise environmental contamination.

15. Be aware of the child's comfort throughout the procedure.	15. To minimise trauma and achieve cooperation.

D: Actions post chemotherapy commencement

Action	**Rationale**
1. All syringes, needles, infusion sets and empty bags should be removed from the patient in the shallow plastic tray whilst still wearing gloves. All waste should be disposed of as per 'Disposal of Cytotoxic Waste' guidelines. Plastic trays should be washed after use and reused.	1. To prevent skin contact and spray into the environment during waste disposal. To prevent risk from any residual contamination and maintain a clean environment.
2. For prolonged infusions, a) continue to monitor the administration equipment for leakage b) ensure that the infusion rates remain as prescribed c) continue to monitor the child for side effects of the drugs being administered.	2. To enable leakage, extravasation and side effects to be dealt with at the earliest opportunity.

11.3 GUIDELINES FOR ADMINISTRATION OF INTRAVENOUS CYTOTOXIC DRUGS VIA PERIPHERAL VEIN

The peripheral intravenous route is not favoured for infusion of cytotoxic drugs due to the risk of extravasation. The peripheral route is used most commonly for the administration of bolus dose chemotherapy when a central venous line is not available. However some chemotherapy will need to be administered peripherally with a mechanical pump device.
Administration of cytotoxic drugs via the peripheral route requires the same principles cited in the procedure for administration of intravenous cytotoxic drugs via central venous line. In addition the following actions must be taken.

Action	**Rationale**
1. Put on additional protective clothing if preferred (see Protective Clothing guidance) before commencing.	1. To prevent the cytotoxic drug administrator from skin contamination.
2. Using an ANTT approach a new cannula, butterfly or peripheral long line (for infusions) should be sited prior to administering cytotoxic drugs, avoiding sites near joints.	2. To reduce the risk of extravasation.
3. Establish the patency of the vein by flushing with normal saline, and by aspirating blood from the cannula.	3. To determine whether the vein will accommodate the extra fluid flow and drugs, and remain patent.
4. The injection site should not be obscured by strapping during the procedure.	4. To allow continuous observation of the vein.
5. Observe the vein throughout the administration procedure. Check for infiltration and patency of the vein every 1- 2ml of a large bolus, and every 0.1-0.2ml of a small bolus, by looking	5. To detect any problems at the earliest moment.

for a show of blood in the cannula ('flash back'). If the chemotherapy is administered via an infusion pump ensure the appropriate pressure sensor is working correctly.	
6. Observe for signs of extravasation, e.g. redness, blanching, swelling, leakage at the injection site, loss of vein patency or reduced flow rate. Ask the child to report any sensations of burning, pain or other changes at the injection site. If there are any doubts, stop and investigate.	6. To prevent unnecessary damage to soft tissues.
7. In the event of extravasation occurring, follow the guidelines for treatment of cytotoxic drug extravasation.	7. To minimise local damage.

11.4 GUIDELINES FOR ADMINISTRATION OF ORAL CYTOTOXIC DRUGS

Administration in hospital

Action	**Rationale**
1. The drug administrator should avoid touching cytotoxic tablets, capsules or suspension. Administration should be by 'no touch' technique.	1. To prevent contact between cytotoxic drugs and the skin.
2. Disposable gloves should be worn when measuring and administering cytotoxic medicines (see Protective Clothing guidance.).	2. To minimise exposure to the administrator.
3. Tablets should not be crushed and capsules should not be opened. Tablets should be segmented and capsule	3. To prevent airborne exposure from powder or liquid released.

opened only in the pharmacy department.	
4. Children should be encouraged to take oral cytotoxic drugs immediately.	4. To maintain a safe environment.
5. Spillage should be dealt with as per guidelines for 'Dealing with Spillage of Cytotoxic Drugs'.	5. To prevent health hazard from spillage.
6. Empty cytotoxic tablet and suspension bottles, medicine pots, oral syringes, medicine spoons and gloves should be discarded in a colour coded cytotoxic 'sharps bin'.	6. To comply with procedure for 'Disposal of Cytotoxic Waste' (section 13).
7. Wash hands thoroughly	7. To prevent risk from any residual contamination

11.5 GUIDELINES FOR ADMINISTRATION OF INTRAMUSCULAR/ SUBCUTANEOUS CYTOTOXIC DRUGS

Administration in hospital

Action	Rationale
1. Disposable gloves should be worn and additional protective clothing if preferred (see Protective Clothing guidance) prior to handling any syringes filled with cytotoxic drugs.	1. To minimise exposure to the administrator.
2. Injection sites should be rotated.	2. To prevent local irritation developing.
3. Following injection, the injection site should be pressed firmly with a gauze swab.	3. To prevent drug leakage onto the skin.
4. Spillage should be dealt with as per guidelines for 'Dealing with Cytotoxic Spillage'.	4. To prevent health hazard from spillage.
5. All syringes, needles and swabs should be removed from the patient in a shallow plastic container kidney dish whilst wearing gloves. All waste should be disposed of as per 'Disposal of Cytotoxic Waste' guidelines	5. To prevent skin contact and spray into the environment during waste disposal.

11.6 GUIDELINES FOR THE RECONSTITUTION AND PREPARATION OF INTRAMUSCULAR ASPARAGINASE

Asparaginase is an enzyme and is not a cytotoxic drug (such as vincristine) and doses not require the special precautions needed for manipulating such agents. Erwinase and Medac E. Coli Asparaginase has to be reconstituted on the ward, as it can only be prepared immediately prior to administration due to its instability. Asparaginase should be administered within 15 minutes of reconstitution.
PEG Asparaginase 750 units/mL is ready reconstituted and is usually prepared in the cytotoxic unit.
Medac Asparaginase 5000 Units is reconstituted with 2mL Water for injection to give 2500 Units/mL
Erwinase Asparaginase 10,000 Units is reconstituted with 1mL 0.9% sodium Chloride for injection to give 10,000 Units/ml
Refer to package insert for further information.

Equipment Required

Disposable gloves
Appropriate size luer lock syringe
1 23 gauge needle
1 filter needle
Vial of Asparaginase
Appropriate dilution as above
Plastic tray
2% Chlorhexidine swab
Gauze
Sharps container

Guidelines

Action	**Rationale**
1. Asparaginase should be reconstituted and administered in the treatment room or IV room with minimal staff present if needed	1. To allow a safe environment for reconstitution of the drug.
2.An ANTT should be used for preparation and administration of asparaginase.	2. To maintain an aseptic technique.

3. Reconstitution should be carried out at waist level.	3. To prevent contamination of the nurse from spray around the face in the event of spillage.
4. Draw up appropriate diluent using a 21 gauge needle.	
5. Wipe the top of the Asparaginase vial with a 2% chlorhexidine swab, and allow to dry.	5. To clean rubber seal of vial.
6. Inject diluent into the vial of Asparaginase. Remove syringe and discard needle into the 'sharps bin'.	6. To produce a solution of Asparaginase.
7. Roll vial between fingers to promote complete reconstitution. Do not shake.	7. To avoid contact with the rubber seal. Contact with the rubber seal denatures the reconstituted drug locally, producing a few minute filaments of insoluble material.
8. Insert syringe and filter needle into the vial, and withdraw the dose required, plus excess for priming a 23 gauge needle (approximately 0.05ml).	8. A luer lock syringe should be used to minimise the risk of leakage at the syringe and needle connection.
9. Change to 23 gauge needle. With the sheath in place, prime the needle ensuring the correct dose remains in the syringe.	9. To ensure the correct dose is prepared and to reduce the risk of environmental contamination.
10. Explain procedures to patient and family	10. To inform and gain consent
11. Select the Ventrogluteal site	11. This is a well developed muscle in infants, children and adults and is a safe site for IM injections in children as it avoids major nerves and blood

	vessels and is associated with fewer complications.
12. Position the patient to relax the muscle: Prone – have the patient lie "toes in" to internally rotate the femur Supine – have the patient flex both knees, if possible, or flex the knee on the side where the injection is to be given Side lying – have the patient flex the upper leg at 20º.	12. there is reduced pain with a relaxed muscle
13. Clean the site with chlorhexidine 2%	13. To clean the skin
14. Bunch the muscle and insert the needle in a dart like fashion at 90º. aspirate slowly and then inject the Asparaginase slowly.	14. to ensure the injection is given in the muscle
15. withdraw the needle keeping the angle at 90o and apply gentle pressure at the site with cotton wool	15. to minimise tissue injury.
16 Dispose of the equipment as 'Disposal of Cytotoxic Waste' guidelines.	

Due to the risk of allergic reaction the patient should be observed for at least 60 minutes following administration of Asparaginase.

11.7 GUIDELINES FOR THE RECONSTITUTION AND PREPARATION OF INTRAVENOUS ASPARAGINASE

Medac E. coli Asparaginase can be given intravenously in some Protocols

Equipment Required

Disposable gloves
Appropriate size luer lock syringe
1 filter needle
1 23 gauge needle
Vial of Asparaginase
2 malls 0.9% sodium chloride
Plastic tray
2% Chlorhexidine swab
Sharps container

Guidelines

Action	**Rationale**
1. Using an ANTT prepare a burette infusion set with 0.9% Sodium chloride prior to drawing up asparaginase	1. To establish a vehicle for drug administration.
3. Using an ANTT prepare the asparaginase as steps 3-8 above	
4. Clean the bung of the burette with a 2% chlorhexidine swab	4. To clean rubber seal of burette
5. Insert the prescribed amount of asparaginase into the appropriate amount of saline in the burette	
6. Connect the burette to the patient and set machine to the appropriate rate	
7. All syringes, needles and swabs should be removed from the patient in a plastic tray whilst wearing gloves. All	7. To prevent skin contact and spray into the environment during waste disposal.

waste should be disposed of as per

Disposal of cytotoxic waste guidelines

Due to the risk of allergic reaction the patient should be observed for at least 60 minutes following administration of Asparaginase.

12 DISPOSAL OF CYTOTOXIC WASTE IN THE HOSPITAL

12.1 Disposal of administration equipment

All equipment which has been used for the administration of cytotoxic drugs needs careful disposal and should be treated as **special waste** in accordance with the Hazardous waste regulations 2005.

- Sharps (needles, ampoules and vials), empty syringes, infusion bags and used infusion sets must all be discarded in a colour coded cytotoxic 'sharps bin'.

- All 'sharps bins' must be sealed securely and labelled with the hospital ward/department, date assembled and signature, date closed and signature. When two thirds full the 'sharps bin' should be sealed.

- Other clinical waste e.g. gloves and disposable kidney dishes, used for cytotoxic drug administration should be disposed of in a yellow bag (oncology unit only) for incineration and labelled with the appropriate cytotoxic sticker(s). Large amounts of clinical waste can be removed by special arrangement with the portering staff.

- Oncology unit generated cytotoxic waste must be stored separately in a designated yellow wheelie bin labelled 'Cytotoxic Waste Only'. The cytotoxic waste should be stored in a designated, clearly identified, locked, area to await collection by the porters. No other waste must be stored in this area. Waste generated in other areas should be removed by contacting the charge hand porter.

- Cytotoxic drug therapy which has not been given to a patient should be sealed in a bag and transported in a cytotoxic transport box to the Pharmacy Cytotoxic Preparation Unit.

  Syringes, infusion bags and any other associated equipment which has been pierced or broken during administration or preparation should be immediately contained. Place in a yellow bag, seal and then put in cytotoxic 'sharps bin' and seal immediately.

- Empty cytotoxic tablet and suspension bottles, medicine pots, syringes/medicine spoons used for oral cytotoxic drug administration should be discarded in a colour coded cytotoxic 'sharps bin'.

12.2 Disposal of body fluids containing cytotoxic drug products

Cytotoxic drugs are excreted in urine, faeces and vomit either in an unchanged form or as active metabolites. The time period for drug excretion varies with individual drugs but can be as long as 7 days.

- Disposable gloves and an apron (see section on protective clothing) must be worn when handling urine, faeces and vomit for 7 days following cytotoxic drug therapy.

- Disposable gloves and apron (see section on protective clothing) must be worn when changing contaminated bed linen and contaminated nappies, for 7 days following cytotoxic drug therapy.

- Nappies, vomit bowls, gloves and apron should be disposed of in a colour coded cytotoxic 'sharps bin' or yellow bag (oncology unit only) for incineration and labelled with appropriate cytotoxic sticker(s).

- Bed linen should be handled as per protocol for contaminated linen. In the unlikely event of heavily contaminated bed linen this should be destroyed by incineration, as per guidelines for dealing with cytotoxic spillage.

- Barrier creams should be applied liberally to children in nappies to protect skin from contaminated urine and faeces.

- Bed pans and urinals containing excreta (urine and faeces) should be cleaned using the bedpan washer into the normal drainage system, or if the patient uses the toilet by flushing the toilet immediately after use. Good toilet hygiene is essential.

- Hands should be washed thoroughly with soap and water after removing gloves.

- If any body fluids containing cytotoxic drug products are spilled follow spillage procedure

13. DEALING WITH SPILLAGE OF CYTOTOXIC DRUGS

Cytotoxic spillages require prompt action to decontaminate the affected area and prevent a further hazard.

A cytotoxic spillage kit is available which contains:

Gloves – 1 pair of disposable gloves, 1 pair of heavy duty
Safety goggles (non disposable BS 2092C)
Disposable scoop
Cytoprotective gown
Face mask (EN 149)
Overshoes
Absorbent towels
Cytotoxic waste disposal bag x 1
Eye wash (2 x 20ml plastic ampoules of water for injection)
1 litre bottle of water
Chemotherapy drugs spill hazard sign
Spillage guidelines

Cytotoxic spillage kits are kept in the following locations:

Oncology in patients x 2
Oncology day care x 1
Theatre x 1
Cytotoxic Unit x 1
Pharmacy x 1
Additional /replacement kits are available from the cytotoxic preparation unit

13.1 Contamination of Staff/Patients

Action	Rationale
Clothing Minor spillage (small area). Wearing a pair of gloves blot with paper towel to remove as much spillage as possible. Major spillage (large volume). Wearing a pair of gloves, clothing should be changed, and washed separately.	To prevent the spread of spillage
Spillage onto gloves – remove gloves and wash hands immediately.	To prevent contamination of the skin
Skin: Wash affected area with copious amounts of soap and water. Do not scrub as intact skin provides protection. seek advice from medical/pharmacy staff and inform nurse in charge. Complete an incident report form and send additional copy to pharmacy.	To decontaminate the skin and prevent potential drug absorption.
Needle stick injury: Follow needle stick injury policy. Seek advice from medical/pharmacy staff and inform nurse in charge. Complete an incident report form and send additional copy to pharmacy.	To minimize the risk of absorption via the bloodstream.
Eyes: Irrigate eye(s) immediately with copious amounts of water. Seek advice from medical/pharmacy staff and inform nurse	To prevent/minimize irritation to the eyes.

in charge. Complete an incident report form and send additional copy to pharmacy.

13.2 Environmental Contamination

Action	Rationale
Isolate the spillage site by taking the patient away from the area keeping the number of staff to a minimum.	To avoid potential hazards to others.
Close doors, switch off fans	To prevent spread of spillage
If staff or patient(s) are contaminated, this should be dealt with first.	
Collect cytotoxic spillage kit from the appropriate site (see above) and a colour coded cytotoxic 'sharps bin'. Place the hazard warning sign in a clearly visible position. Put on protective clothing – gown, goggles, overshoes, face mask, 2 pairs of gloves (inner and outer heavy duty).	
Place the cytotoxic container (syringe/bag immediately into a yellow bag, seal, then place in the colour coded cytotoxic 'sharps bin'.	To remove spillage from area to ensure safe disposal of hazardous waste. To comply with guidelines for 'Disposal of Cytotoxic Waste'
Place paper towels over contaminated areas. The clean up process should proceed from areas of least to greatest contamination, to prevent further spread. If the spillage contains powder, wipe up the powder with a damp cloth. If broken glass is involved this is best cleaned up using a disposable scoop and a thick wad of damp paper. Place broken	

glass into the colour coded cytotoxic 'sharps bin'.	
Using a clean cloth and copious amounts of water, clean the spillage area again. Rinse all equipment and hard surfaces. Dry with paper towels.	To ensure thorough cleaning

Action	**Rationale**
If bed linen is contaminated, remove Immediately and treat as contaminated linen as per Infection Control and Notifiable Diseases Policy C15.	To prevent hazard to laundry staff
Place all contaminated cleaning material in the colour coded cytotoxic 'sharps bin'. remove outer gloves followed by mask, overshoes and gown and place in the colour coded cytotoxic 'sharps bin'. Remove goggles and rinse in running water. (Goggles should be returned to the Cytotoxic Preparation Unit). Remove inner gloves and dispose of in the colour coded cytotoxic 'sharps bin'. Seal the colour coded cytotoxic 'sharps bin' and label.	To ensure safe disposal of hazardous waste.
Wash hands and exposed skin surfaces thoroughly with soap and water. If there has been any contact from cytotoxic drugs on skin see above - contamination of staff and patients	
Contact a Domestic Assistant immediately to clean the affected area with 1% chlorine solution (e.g 1 Haztab, available on the Oncology ward, in 250ml water).	
The sealed, colour coded cytotoxic 'sharps bin' should be removed from the location as soon as possible in accordance with guidelines	

for 'Disposal of Cytotoxic Waste'

Complete an incident form and send an additional copy to pharmacy. Spillage of a large amount of cytotoxic drug,to which people could have been exposed, should be reported to HSE. This must be stated clearly on the trust incident form.	To comply with hospital Policy and HSE.
Inform pharmacy and request more cytotoxic therapy if appropriate and a new spillage kit.	To ensure chemotherapy course completed and unused spillage kit is available.

13.3 Spillage during transport

Due to their potentially hazardous nature parenteral cytotoxic drugs are packed in heat sealed plastic sleeves and transported in designated rigid, security sealed containers.
Oral cytotoxic drugs are supplied in child resistant containers or blister packs as appropriate, placed in sealable plastic bags and transported in a security sealed, pharmacy ward transport bag.

If the spillage occurs during transit it should be contained within the plastic sleeve/bag and the transport container.

Leakage contained within plastic sleeve/bag or transport container

Action	**Rationale**
If leakage is contained within the plastic sleeve/bag. Do not open. Contact the pharmacy cytotoxic unit/on call pharmacist.	To prevent risk from contamination.
If leakage has occurred through the plastic sleeve/bag but is contained within the transport container – do not handle any items within the container. Contact the pharmacy cytotoxic unit/ on-call pharmacist.	To prevent risk from any residual contamination.

In the unlikely event of leakage through these containers the personnel involved must take the following action:

Isolate the spillage site. Place the hazard warning sign in a clearly visible position. (The warning sign is in a wallet attached to the side of the transport box).	To avoid potential hazard to others.
During normal working hours (9.00am to 5pm, weekdays, 9am to 4pm weekends and bank holidays) contact the pharmacy cytotoxic unit to clean up the spill. Outside these hours contact the oncology ward for advice and inform the on-call pharmacist.	To ensure that spillage is dealt with in an appropriate manner.

14. GUIDELINES FOR THE PREVENTION AND TREATMENT OF CYTOTOXIC DRUG EXTRAVASATION

INTRODUCTION

Extravasation is the inadvertent leakage of fluid and/or medication from blood vessels into interstitial tissues. It is important that precautions are taken to prevent extravasation, but if it occurs treatment must be initiated immediately.

PREVENTION OF EXTRAVASATION

1. Cytotoxic drugs should be administered by appropriately trained, competent personnel.

2. All personnel administering cytotoxic drugs should be aware of vesicant agents and the risks of ulceration and necrosis on direct tissue contact and have an understanding of the management of extravasation and know the contents and whereabouts of the extravasation kit.

3. Vesicant (high risk of tissue necrosis) drugs should be administered via a central line wherever possible. Where a peripheral route must be used this should be via a newly sited butterfly or Teflon catheter, or a peripheral long line if possible avoiding the dorsum of the hand or foot and sites over joints. The most vesicant drug(s) should be administered first.

4. The positioning and patency of a central line should be checked prior to the administration of vesicant drugs (e.g. by bleeding/flushing the line). Where lines do not sample imaging may be required to confirm correct positioning. If in doubt do not give drug and arrange contrast studies. Dressings should be taken down from a peripheral line and blood drawn back before and during administration and the site observed for signs of swelling or leakage.

5. Any infusion pump used to administer vesicant drugs must have an in-built sensor to detect increased resistance with an alarm to signal this.

6. Wherever possible vesicant drugs should not be administered in concentrations higher than the manufacturer's recommendations.

7. The vein should always be flushed after administration of drug.

Classification of cytotoxic drugs

Adapted from National Extravasation Information Service Website 2006
(The National Extravasation Information Service 2005)

Neutrals: Group 1	**Inflammitants: Group 2**	**Irritants: Group 3**	**Exfoliants: Group 4**	**Vesicants: Group 5**
Asparaginase	Fluorouracil	Carboplatin	Cisplatin	Amsacrine
Bleomycin	Methotrexate	Etoposide	Liposomal Daunorubicin	Carmustine
Cladribine	Etoposide Phosphate	Irinotecan	Liposomal Doxorubicin	Dacarbazine
Cyclophosphamide			Topotecan	Dactinomycin
Cytarabine			Docetaxel	Daunorubucin
Fludarabine			Topotecan	Doxorubicin
Gemcitabine			Oxaliplatin	Epirubicin
Gemtuzumab				Idarubicin
Ifosfamide				Mitozantrone
Melphalan				Mustine
Rituximab				Vinblastine
Thiotepa				Vincristine
Alemtuzumab				Vindesine
Aldesleukin (IL-2)				Vinorelbine
				Paclitaxel

RECOGNITION OF EXTRAVASATION

Extravasation should be suspected if:

- Patient complains of burning, stinging pain, or other changes at injection site. Observation of small children and infants is of vital importance as they cannot report such symptoms. Crying and distress during drug administration should always be taken seriously and investigated.

- Induration, swelling, or leaking at injection site.

- Redness or blanching of tissue at site. (It should be noted that doxorubicin may produce a venous flare reaction, with local oedema and streaking over the injection site but this is not usually painful)

- No blood return observed, although blood return may be seen where extravasation has occurred.

- Intravenous infusion does not flow freely. Care needs to be taken when using infusion pumps to administer vesicant drugs. They must always have an alarm to signal increased resistance.

- Resistance is felt when trying to give drugs by bolus.

Monitor children with central lines for any sign of swelling at the neck

Monitor children with port-a cath for any pain, leakage or bleeding from needle insertion site

Investigate immediately any sudden onset of pain in the neck, chest, or local to a port site

MANAGEMENT OF EXTRAVASATION

General Principles:

- Immediate action is required if extravasation is suspected.

- All personnel who administer Cytotoxic Drugs intravenously must be aware of the extravasation guidelines.

- Extravasation guidelines and kit must be available whenever Cytotoxic

Drugs are administered intravenously.

GUIDELINES FOR MANAGEMENT OF EXTRAVASATION

1. Stop infusion/injection immediately
2. Seek assistance if necessary
3. Leave cannula or gripper needle in place
4. Aspirate as much of the drug as possible, draw blood back if possible from cannula or gripper needle.
5. Remove the cannula or gripper needle.
6. Give analgesia if required
7. Mark affected area with marker pen
8. Inform consultant
9. If appropriate elevate limb.

At this stage, management depends on the agent involved:

A) NON VESICANTS (Neutrals, Inflammitants, irritants, exfoliants)

Tissue damage is unlikely to occur, even when there is local irritation or inflammation. Management should be aimed at relieving symptoms.
Any sign of swelling, inflammation or erythema apply cold compresses (for the first 24 hours) and if appropriate elevate the limb.

- If platinum based drug(cisplatin, carboplatin, oxaliplatin) apply heat pack to aid dispersal of drug
- If there is persistent local inflammation erythema apply topical hydrocortisone (1%) up to 4 times per day until inflammation or erythema subsides
- If no sign of inflammation or erythema, no further management is likely to be required.

B) VESICANTS

There is a high risk of tissue necrosis. Early, aggressive intervention is indicated where significant extravasation has occurred in order to minimise morbidity and should be referred to a plastic surgeon. management then depends on the type of extravasation.

A Anthracyclines (Daunorubicin, Doxorubicin, Epirubicin, Idarubicin and Mitozantrone (NB Liposomal Daunorubicin is Classed as an exfoliant

1. Cleanse the area with sachets of Sodium Chloride 0.9%.
2. Apply a cold pack firmly but without pressure, intermittently for 30 minutes every 4- 6 hours over the area for the first 24 hours, unless advised otherwise. The cold pack should not be placed directly on the skin. Place a piece of dry gauze between the skin and the cold pack.
3. Apply topical Dimethyl Sulfoxide (DMSO) 50 %(v/v), by painting on with a 'cotton bud' at the extravasation site and allowing it to dry. This should be done every 4-6 hours for the first 24 hours. Avoid contact with good skin. If blister forms stop DMSO and seek further advice.
4. For the next 6 days apply DMSO every 6 hours. Do not use an occlusive cover. If required cover once the area is dry. If blister forms stop DMSO and seek further advice.

B Vinca Alkaloids (Vinblastine, Vincristine, Vindesine and Vinorelbine

1. Cleanse the area with sachets of Sodium Chloride 0.9%.
2. Infiltrate the site with 1500 units of hyaluronidase in 1ml Sodium chloride 0.9% for injection. Inject subcutaneously 0.1 to 0.2mL at several areas around the circumference of the extravasated area. Gently massage the area to facilitate dispersion.
3. Apply a heat pack firmly but without pressure, continuously for 24 hours. The heat pack should not be placed directly on the skin. Place a piece of dry gauze between the skin and the heat pack.

C All other vesicants (Amsacrine, Carmustine, Dacarbazine, Dactinomycin)

1. Cleanse the area with sachets of Sodium Chloride 0.9%.
2. Apply a cold pack firmly but without pressure, intermittently for 30 minutes in every 6 hours over the area for the first 24 hours, unless advised otherwise. The cold pack should not be placed directly on the skin. Place a piece of dry gauze between the skin and the cold pack.
3. Elevate the limb where this is appropriate (site dependent)

FOLLOW UP

In all cases of extravasation the affected area should be inspected for signs of erythema, induration, blistering and necrosis. After initial referral to the surgeon, they should be asked to review any patient with developing signs of tissue necrosis. Good results have been achieved using techniques of saline flush out at an early stage in extravasation injuries.

Any extravasation should be recorded in a patient's case notes including details of the drugs involved, size and location of cannula, measurement of the affected area, procedure followed, any specific antidotes used and outcomes. The extravasation reporting form (Green card in extravasation kit or see national database below) should be completed. If reporting online print a copy of the form before submitting and if using a green card make a copy before sending to the national database. The copy must be sent to the pharmacy cytotoxic preparation unit. The pharmacist will send a copy to the network pharmacist. A photograph of the injury may be helpful in following up the incident. An incident form should be completed.

It should be remembered that necrosis and tissue ulceration may occur a considerable time after extravasation has taken place.

On discharge parent/guardians and patients should be asked to observe the extravasation site daily and immediately report any increased discomfort or significant change, such as peeling or blistering of the skin.

NATIONAL DATABASE

A national database of extravasation incidents is being complied at St Chad's Unit, City Hospital, Dudley Road, Birmingham. Extravasation reporting forms (green cards) are available on line www.extravasation.org.uk/Greenmenu.htm. or in the extravasation kit.

RECOMMENDED CONTENTS OF EXTRAVASATION KIT

1. Summary of extravasation guidelines and reporting form
2. Syringes - 5 ml + 2 ml
3. Needles - 2 x 21 g (drawing up) 2 x 25 g (injection)
4. Sodium chloride 0.9% for injection
5. Hyaluronidase 1500 units for injection
6. Chlorhexidine wipes 2%
8. Hydrocortisone cream 1%
9. Sterile gauze
10. Direction to the nearest 'Instant' Cold Pack
    'Instant' Hot Pack
11. Dimethylsulphoxide (DMSO) 50% aqueous solution for topical Use
12. Sodium Chloride 0.9% sachet (25Ml)
13. Green card

Extravasation Kits are available from The Cytotoxic Preparation Unit

☞ FOR FURTHER INFORMATION CONTACT PHARMACY

Alder Hey Children's NHS
NHS Foundation Trust

Management of Extravasation or suspected Extravasation

Immediate Management

Never apply pressure initially

Step 1 Stop the infusion or injection –

Step 2 Seek assistance if needed

Step 3 Leave cannula or gripper needle in place

Step 4 Aspirate as much drug as possible, trying also to draw some blood back into the cannula or gripper needle

Step 5 Remove cannula or gripper needle

Step 6 Provide analgesia if required

Step 7 Mark the affected area

Step 8 Inform consultant

Step 9 Elevate the limb

Step 10 For **anthracyclines, other vesicants , vinca alkaloids,** and other drugs FOLLOW SPECIFIC ANTIDOTE GUIDANCE ON THE BACK OF THIS SHEET.

Step 11 Measure the area of extravasation, document any treatment and photograph injury if possible

Subsequent Steps

Step 12 Complete Green Card and send to the pharmacy cytotoxic preparation unit. Complete trust incident form.

Step 13 Refill extravasation kit – send to pharmacy cytotoxic preparation unit

This is a quick reference guide only and must be read in conjunction with the Guidelines for the prevention and treatment of cytotoxic drug extravasation on the intranet.

Specific Antidotes in the Management of Peripheral Extravasation

Drug / Class of drug	Warm / Cold compression	Specific antidote
Vinca Alkaloids Vincristine Vindesine Vinblastine Vinorelbine	**Warm** compression- apply for 24 hours	**Hyaluronidase 1500 IU** Draw up 1500IU hyaluronidase in 1ml Sodium Chloride 0.9% for injection. Inject 0.1 to 0.2ml subcutaneously at points of the compass around the circumference of the area of extravasation
Anthracyclines Daunorubicn Doxorubicin Epirubicin Idarubicn Mitozantrone Mitomycin C	Apply cold pack intermittently for 30minutes in every 2 hours for 24 hours. Place a piece of dry gauze between skin and cold pack	**Topical DMSO 50%** Apply Topical DMSO 50% using a cotton bud every 2 hours at the extravasation site for 24 hours. Avoid contact with good skin. For the next 7 days apply DMSO50% every 6 hours alternating with topical hydrocortisone 1% cream every 3 hours. Do not use an occlusive cover. If blistering occurs, stop DMSO and seek further advice.
Any other cytotoxic drug	Automatic cold or warm compression is **not** required. However if symptoms warrant then use intermittent cold compression except in the case of oxaliplatin, cisplatin, or carboplatin when warm compression may be used.	**No specific antidote needed** If signs of erythema persist then **topical 1% hydrocortisone cream** may be used. Apply sparingly to the affected area 4 times a day while symptoms persist.

15 GUIDELINES ON PRE-CHEMOTHERAPY INVESTIGATIONS AT POSCU

Guidelines/protocols covering laboratory blood tests and other investigational parameters to be fulfilled prior to courses and cycles of chemotherapy are contained within the chemotherapy protocol, pre-treatment work up sheets, chemocare prescriptions or identified within the case notes at the PTC.
The only pre chemotherapy investigations completed at the POSCU, as part of the whole process of chemotherapy delivery, are laboratory blood tests prior to delivery of chemotherapy at the PTC.
Bloods as requested by the PTC may be taken by POSCU staff and are likely to be limited to full biochemical and haematology profile. These results are faxed to the PTC as part of the pre chemotherapy check.

16 PRESCRIBING, SUPPLY AND ADMINISTRATION OF CHEMOTHERAPY FOR MALIGNANT CONDITIONS AT A POSCU

16.1 Diagnosis and commencement of treatment

Treatment must be initiated by a cancer specialist (consultant) at the PTC.

16.2 Prescribing

Patient specific MDT outcome forms, initial patient summaries and ward discharge summaries are sent to the shared care centre. POSCUs will also have access to agreed network wide supportive care protocols.
Each course and cycle, including the final cycle, of chemotherapy is commenced and delivered at the PTC. Treatment records are available at the PTC. The involvement of the POSCU is limited to administration of oral chemotherapy and intravenous cytarabine. Prescriptions for these are written and dispensed at the PTC and given to parents as part of their discharge.

Junior doctors at ST3 level and below must not prescribe cytotoxic chemotherapy.

16.2.1 Oral Chemotherapy

If the patient is admitted to a POSCU oral chemotherapy is stopped with the exception of steroids which must be continued. Oral chemotherapy should be restarted only after consultation with the specialist at the Alder Hey Oncology Unit

If chemotherapy to be restarted. the prescriber must refer to the patient's oral chemotherapy record and dispensed medication label. The record contains contact details for specialist information and advice and the name of the patient's consultant. The record will also indicate the treatment plan: the name of the treatment regimen, stage of protocol, blood count results, oral chemotherapy prescribed including duration of treatment.

If the chemotherapy record is not available or medication label differ to the specialist advice given, written confirmation of the dosage will be faxed or emailed from the PTC to the POSCU.

The prescriber at POSCU must record details of the communication in the patients local case notes.

Once confirmed the oral chemotherapy is transcribed on to the local hospital prescription sheet. This transcription is only undertaken by a consultant, NCCG, specialist trainee at ST3 level or above, or a non medical prescriber.

For patients on a clinical trial this should be indicated on the prescription - 'Clinical Trial' .

16.2.2 Parenteral chemotherapy

The only parenteral chemotherapy that may be administered at a POSCU or in the community is Intravenous cytarabine.

This treatment will be prescribe at the PTC on a community/shared care administration record.

This record form gives authority to administer the medication prescribed. The record must be signed when a dose is given.
On completion of the cycle the record form must be faxed back to the PTC for filing in the patient's case notes. The original should be kept for local hospital records.

16.3 Supply

All chemotherapy will be dispensed from the PTC.

16.4 Administration

Chemotherapy may be administered at a POSCU by appropriately trained nursing staff. Refer to section 11, Alder Hey Children's NHS Foundation Trust, Operational Policy On The Use Of Cytotoxic Drugs for The Treatment Of Malignant Disease

17 PRESCRIBING, SUPPLY AND ADMINISTRATION OF CHEMOTHERAPY FOR MALIGNANT CONDITIONS AT HOME

Parents/carers and community nurses may be trained to administer oral chemotherapy or intravenous cytarabine at home.

17.1 Prescribing

All treatment to be given at home will be prescribed at the PTC.
(See section 5 of this policy, Prescribing chemotherapy for malignant conditions and 5.6.1 (ii) chemotherapy to be given at home).

17.2 Supply

All chemotherapy will be dispensed from the PTC.

17.3 ADMINISTRATION

Parents/carers may be trained to administer oral chemotherapy or intravenous cytarabine at home. Training is provided at the PTC by nursing staff trained in accordance with section 11 of this policy Community nurses may also be trained (refer to section 11) to administer oral chemotherapy or intravenous cytarabine at home.

Training, verbal and written information is provided on the following:
Safe handling and storage of cytotoxic drugs
Drug administration
Disposal of cytotoxic waste at home (administration equipment and body fluids containing cytotoxic drug products)
Dealing with spillages
Specific drug information including potential side effects

For intravenous cytarabine the person that gives the drug must sign the community/shared care administration record when the dose has been given. On completion of the cycle the record form must be faxed back to the PTC for filing in the patient's case notes. The original should be kept for local hospital records.

Refer to the Oncology Unit Family Held record for further information.

Abbreviations

ANTT	**Aseptic Non Touch Technique**
DTC	**Drugs and Therapeutics Committee**
CCLG	**Children's and Cancer Leukaemia Group**
MDT	**Multidisciplinary Team**
MCCN	**Merseyside and Cheshire Cancer Network**
PTC	**Principal Treatment Centre**
POSCU	**Paediatric Oncology Shared care Unit**
ST4	**Specialist trainee level 4**